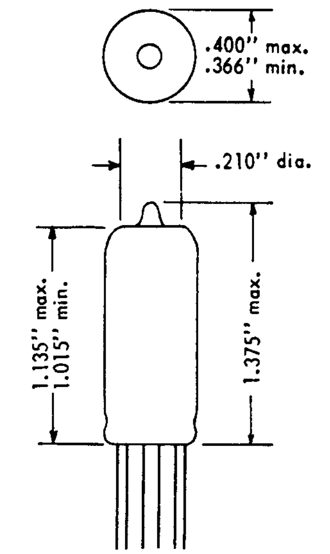
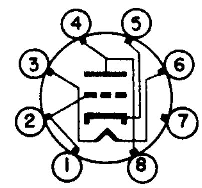
RELIABLE SUBMINIATURE TRIODE

TYPE CK6247WA

Excellence in Electronics





BOTTOM VIEW
8FO

The CK6247WA is a heater-cathode type high-mu triode of subminiature construction designed for applications where freedom from microphonic response is of primary importance. The mechanical design is such that microphonic output due to structural resonances is reduced throughout the audio frequency range by approximately 20 db as compared to more conventional triodes. It is particularly useful in voltage amplifier circuits where its low microphonic noise and vibration output are essential for specialized military electronic equipment. It is intended for service where extreme conditions of mechanical shock or vibration are encountered. The flexible terminal leads may be soldered or welded directly to the terminals of circuit components without the use of sockets. Standard 8 – Pin subminiature sockets may be used by cutting the leads to a suitable length.

MECHANICAL DATA

ENVELOPE: T–3 Glass

BASE: Subminiature Button 8–Pin (0.017" tinned flexible leads. Length: 1.5" min.)

TERMINAL CONNECTIONS:

Lead 1 Grid	Lead 5 Cathode
Lead 2 Grid	Lead 6 Heater
Lead 3 Heater	Lead 7 No Connection
Lead 4 Plate	Lead 8 Plate

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock Test–Note 3)	450 G
Maximum Uniform Acceleration (Centrifuge Test–Note 4)	1000 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test–Note 5)	2.5 G
Maximum Bulb Temperature	220 °C

MOUNTING POSITION: Any

ELECTRICAL DATA

CAUTION–To Electronic Equipment Design Engineers: Special attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

RATINGS AND NORMAL OPERATION:	MIL-E-1 SYMBOL	DESIGN MINIMUM	NORMAL TEST CONDITIONS (Note 7)	NORMAL OPERATION (Note 6)	DESIGN MAXIMUM	MIL-E-1 UNITS
Heater Voltage (Note 8)	Ef:	5.7	6.3	6.3	6.9	V
Plate Voltage	Eb:	----	250	250	275	Vdc
Grid #1 Voltage	Ec1:	–55	0	0	----	Vdc
Plate Dissipation	Pp:	----	----	1.05	1.25	W
Grid #1 Circuit Resistance	Rg1:	----	----	1.0	1.2	Meg.
Heater-Cathode Voltage	Ehk:	–200	----	100	+200	v
Plate Current	Ib:	0.5	----	4.2	6.5	mAdc
Cathode Resistance	Rk:	----	500	500	----	ohms
Grid Current	Ic:	----	----	----	1.0	mAdc
Transconductance (1)	Sm (1):	----	----	2650	----	µmhos
Amplification Factor	Mu:	----	----	60	----	----

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS PART 1		**Combined AQL = 1.0% excluding Mechanical and Inoperatives**								
Heater Current:		0.65	If:	190	----	200	----	210	----	mA

Tentative Data

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS PART 1 (cont'd)										
Heater-Cathode Leakage:	Ehk=+100 Vdc	0.65	Ihk:	----	----	----	----	5	----	μAdc
	Ehk=−100 Vdc		Ihk:	----	----	----	----	5	----	μAdc
Grid Current:		0.65	Ic (1):	----	----	----	----	−0.3	----	μAdc
Plate Current (1):		0.65	Ib (1):	3.0	3.6	4.2	4.8	5.5	1.2	mAdc
Plate Current (2):	Ec1=−8.0 Vdc	0.65	Ib (2):	----	----	----	----	50	----	μAdc
Transconductance (1):		0.65	Sm (1):	2100	2350	2650	2950	3200	550	μmhos
AC Amplification:	Esig=0.2 Vac; Ebb=100 Vdc; Ecc1=0; Rg1=10 Meg; Rp=0.5 Meg; Rk=0.	0.65	Ep:	5.0	----	----	----	----	----	Vac
Continuity and Shorts (Inoperatives):		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope (8−1) (Note 10)	----	----	----	----	----	----	----	----	----
MEASUREMENTS ACCEPTANCE TESTS PART 2										
Insulation of Electrodes:	Ef=6.3 V; Eg−all=−100 Vdc	2.5	Rg1−all:	100	----	----	----	----	----	Meg.
	Ep−all=−300 Vdc		Rp−all:	100	----	----	----	----	----	Meg.
Transconductance (2):	Ef=5.7 V	2.5	Δ_{Ef} Sm (2):	----	----	----	----	7.5	----	%
Grid Emission:	Ef=7.5 V; Preheat 5 minutes at Ec1=0; Test at Ec1=−10 Vdc.	6.5	Ic (2):	----	----	----	----	−0.5	----	μAdc
AF Noise:	Esig=25 mVac; Rp=0.2 Meg; Rg1=1.0 Meg.	2.5	EB:	----	----	----	----	17	----	VU
Amplification Factor:		6.5	Mu:	51	55	60	65	69	8	----
Capacitance:			Cgp:	1.1	----	1.7	----	2.3	----	μμf
Capacitance:	(Note 2)	6.5	Cin:	1.4	----	2.0	----	2.6	----	μμf
Capacitance:			Cout:	0.5	----	0.7	----	0.9	----	μμf
Low Pressure Voltage Breakdown:	Pressure=55±5 mm Hg; Voltage=300 Vac	6.5	----	----	----	----	----	----	----	----
Operation Time:	(Note 11)	4.0	t:	----	----	----	----	20	----	sec.
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	2.5	Ep:	----	----	----	----	2.5	----	mVac
Vibration (3):	F=30−1000 cps; G=15; Rp=10,000 ohms; Positions X_1 and X_2 only	6.5	ep:	----	----	----	----	25 peak to peak	----	mV
DEGRADATION RATE ACCEPTANCE TESTS										
Subminiature Lead Fatigue:		2.5	----	4.0	----	----	----	----	----	arcs
Shock (1):	Ehk=+100 Vdc; Rg=0.1 Meg.; Hammer Angle=30° (Note 3)	20	----	----	----	----	----	----	----	----
Fatigue (1):	96 Hours; G=2.5; Fixed frequency; F=25 min. 60 max.; (Note 5)	6.5	----	----	----	----	----	----	----	----
Fatigue (2):	6 Hours; G=10; Fixed frequency; F=25 min. 60 max.; (Note 12)	6.5	----	----	----	----	----	----	----	----
Post Shock (1) and Fatigue Tests (1) and (2) End Points:		----	----	----	----	----	----	----	----	----
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	----	Ep:	----	----	----	----	5.0	----	mVac

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
DEGRADATION RATE ACCEPTANCE TESTS (cont'd)								
Heater-Cathode Voltage:	Ehk=+100 Vdc Ehk=–100 Vdc	---- ----	Ihk: Ihk:	---- ----	10 10	µAdc µAdc		
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	Δ_tSm(1):	----	10	%		
Grid Current:		----	Ic(1):	----	–1.0	µAdc		
Shock (2):	G=75; (Hammer Angle=120°+rubber pad); t=10 milliseconds; Ehk=+100 Vdc; Rg=0.1 Meg. (Note 13)	----	----	----	----	----		
Shock (2) End Points:		----	----	----	----	----		
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	----	Ep:	----	5.0	mVac		
Heater-Cathode Voltage:	Ehk=+100 Vdc Ehk=–100 Vdc	---- ----	Ihk: Ihk:	---- ----	10 10	µAdc µAdc		
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	Δ_tSm(1):	----	10	%		
Grid Current:		----	Ic(1):	----	–1.0	µAdc		
Glass Strain (Thermal Shock):		6.5	----	----	----	----		
ACCEPTANCE LIFE TESTS								
Heater Cycling:	Ef=7.5 V; Eb=Ec1=0V; Ehk=140 Vac; 1 min. on, 1 min. off	1.0	----	----	2000	cycles		
Heater Cycling Life Test End Points:		----	----	----	----	----		
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=–100 Vdc	---- ----	Ihk: Ihk:	---- ----	20 20	µAdc µAdc		
1 Hour Stability Life Test:	TA=Room; Ehk=+200 Vdc; Rg=1.0 Meg.	----	----	----	----	----		
1 Hour Stability Life Test End Points:	(Typical Sample Size=50 tubes)	----	----	----	----	----		
Change in Transconductance (1) of individual tubes:		1.0	Δ_tSm(1):	----	10	%		
100 Hour Survival Rate Life Test:	TA=Room; Ehk=+200 Vdc; Rg=1.0 Meg.	----	----	----	----	----		
100 Hour Survival Rate Life Test End Points:	(Typical Sample Size=200 tubes)	----	----	----	----	----		
Continuity and Shorts (Inoperatives):		0.65	----	----	----	----		
Transconductance (1):		1.0	Sm(1):	1850	----	µmhos		
Intermittent High Temperature Life Test:	T Bulb=220°C; Ehk=+200 Vdc; Rg=1.0 Meg.	----	----	----	----	----		
500 Hour Intermittent High Temperature Life Test End Points:	(Typical Sample Size=20 tubes 1st sample 40 tubes 2nd sample)	----	----	----	----	----		
Inoperatives:		----	---	----	----	----	1	3
Grid Current (1):		----	Ic(1):	----	–0.5	µAdc	1	3

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
Heater Current:			If:	180	220	mA	1	3
Change in Transconductance (1) of individual tubes:			Δ_tSm(1):		20	%	1	3
Transconductance (2):	(Note 9)		Δ_{Ef}Sm(2):		15	%	2	5
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc		Ihk: Ihk:		10 10	μAdc μAdc	2	5
Insulation of Electrodes:								
g1−all p−all			Rg1−all: Rp−all:	50 50		Meg. Meg.	2	5
Transconductance (1) Average Change:			Avg.Δ_tSm(1):		15	%	...	...
Total Defectives:							4	8
1000 Hour Intermittent High Temperature Life Test End Points:	(Typical Sample Size= 20 tubes 1st sample 40 tubes 2nd sample)						...	...
Inoperatives:							2	5
Grid Current (1):			Ic(1):		−1.0	μAdc	2	5
Heater Current:			If:	177	223	mA	2	5
Change in transconductance (1) of individual tubes:			Δ_tSm(1):		30	%	2	5
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc		Ihk: Ihk:		15 15	μAdc μAdc	2	5
Total Defectives:							5	10

NOTES

Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1 "Inspection Instructions for Electron Tubes," and MIL-STD-105A.

Note 2: Without shield.

Note 3: Test conditions and acceptance criteria per Shock Test Procedures of MIL-E-1 basic specifications.

Note 4: Centrifuge Test with forces applied in any direction.

Note 5: Test conditions and acceptance criteria per Fatigue Test procedures of MIL-E-1 basic specifications.

Note 6: These normal values represent conditions at which control of reliability may be expected.

Note 7: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.

Note 8: For most applications the performance will not be adversely affected by ±10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

Note 9: Change of transconductance for individual tubes from that value measured at Ef=6.3 V to that value measured at Ef=5.7 V.

Note 10: In addition to meeting the tightened electrical, physical and mechanical tests described in this data sheet these Raytheon Reliable Tubes are now guaranteed to be free from "potential" defects identifiable by microscopic inspection as described by paragraph 5.3.8 of "Inspection Instructions for Electron Tubes."

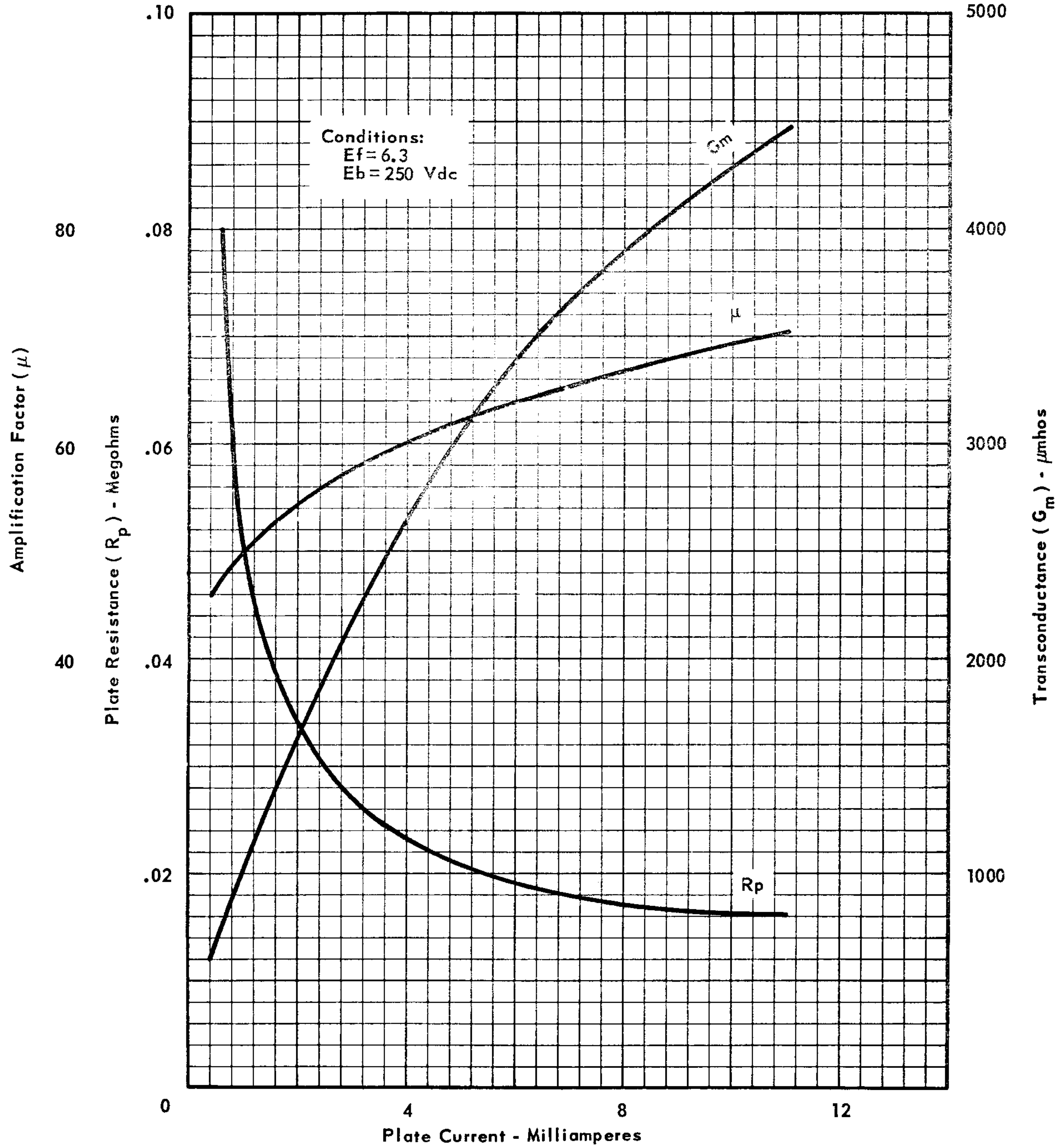
Note 11: Operation time is the time in seconds required for the plate current to attain a value within plus or minus 10 percent of the 3 minute plate current (1) value. No preheating before this test will be allowed.

Note 12: The tube shall be rigidly mounted on a table vibrating with simple harmonic motion. The tube shall be vibrated for a total of 6 hours, 2 hours in each of three positions, X_1, X_2 and Y_1. Only rated rated heater voltage shall be applied. Tubes which show one or more of the following defects shall be considered failures:

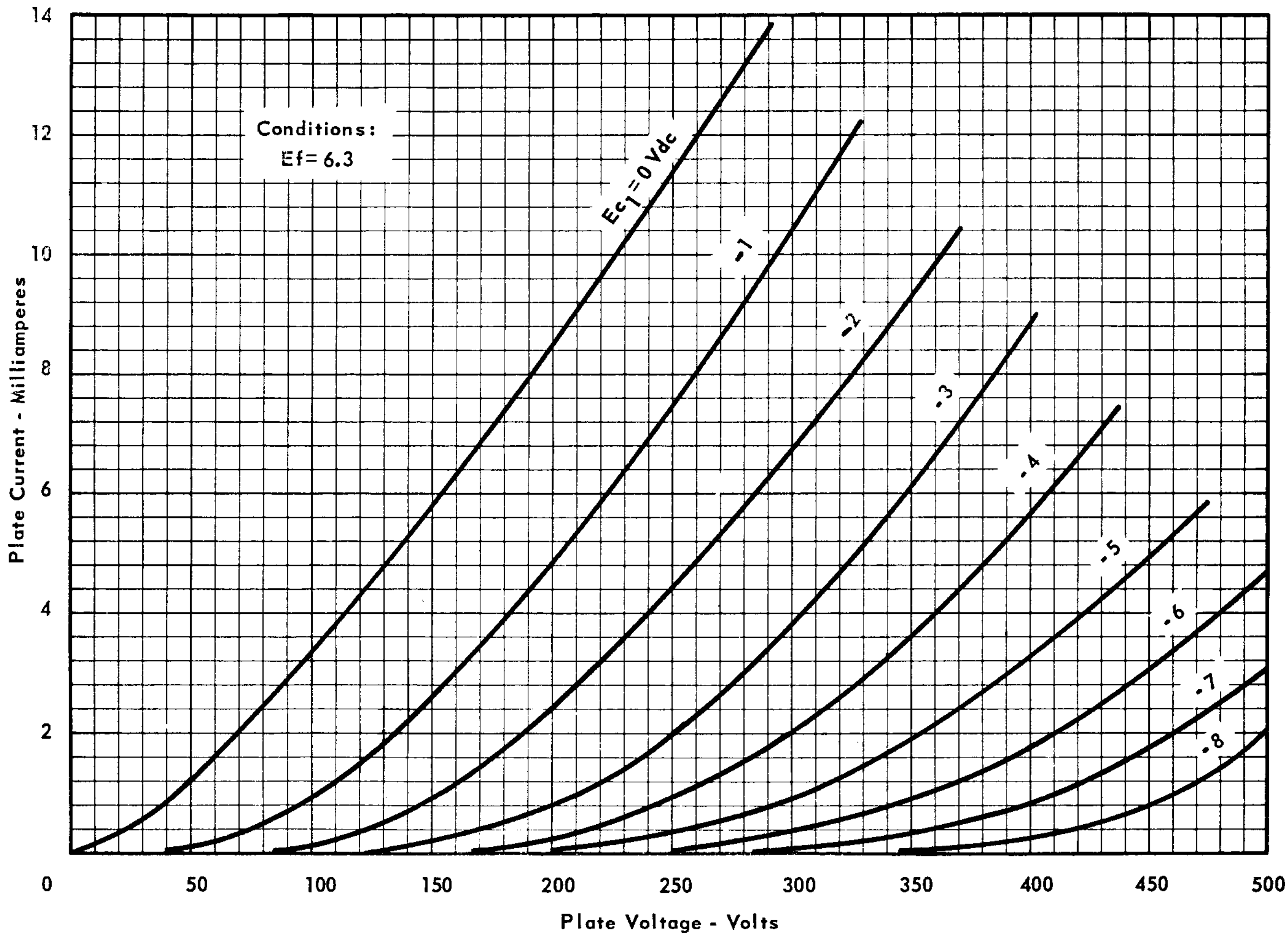
- (a) Tubes which show permanent or tap shorts or open circuits following fatigue test, when tested as specified in 4.7.2 and 4.7.3.
- (b) Tubes which do not comply with post fatigue limits. This is a destructive test.

Note 13: The provisions of MIL-E-1 ref. 4.9.20.5 shall apply except for test conditions listed for Shock Test (2):

AVERAGE CHARACTERISTICS

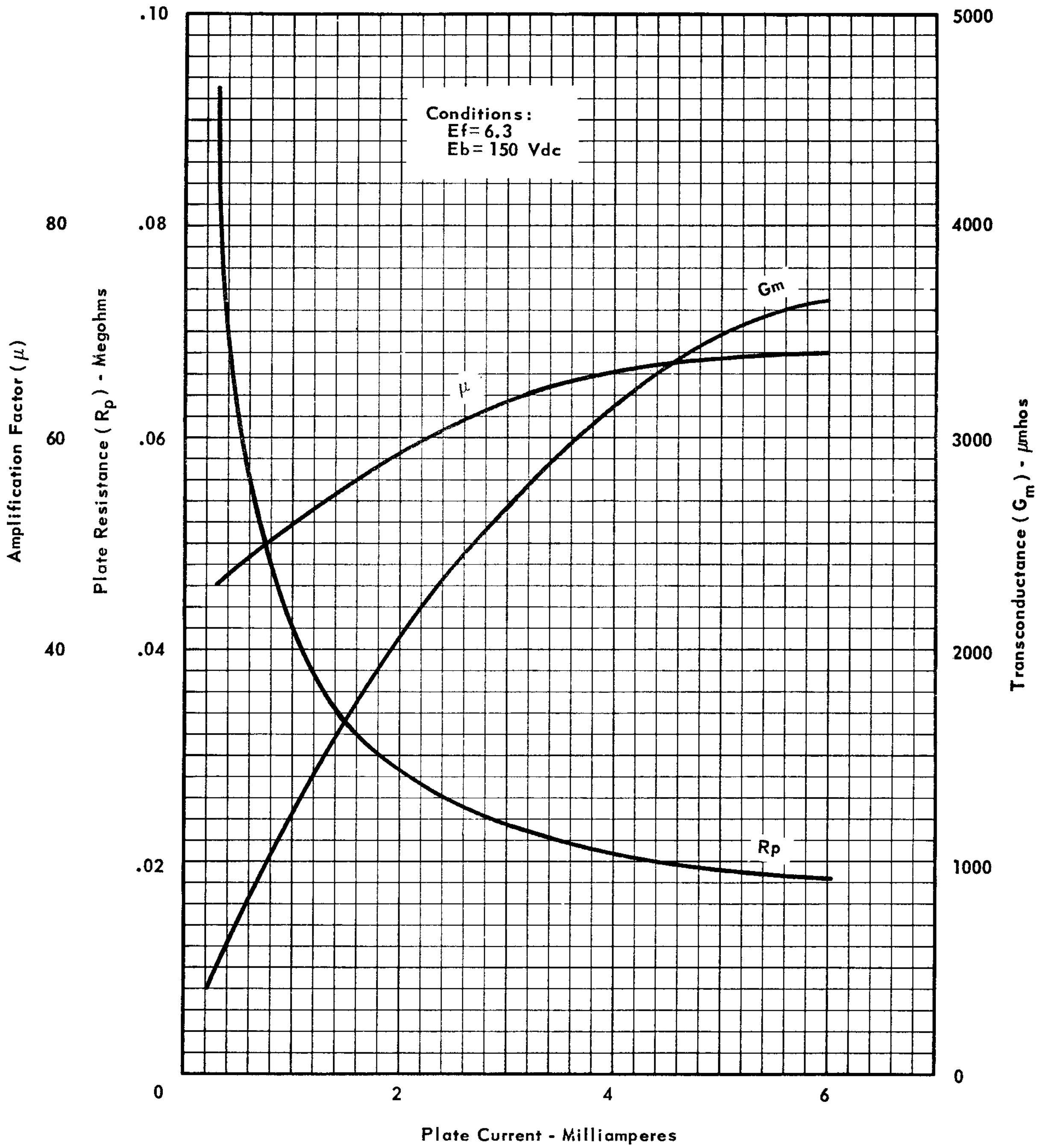


AVERAGE PLATE CHARACTERISTICS

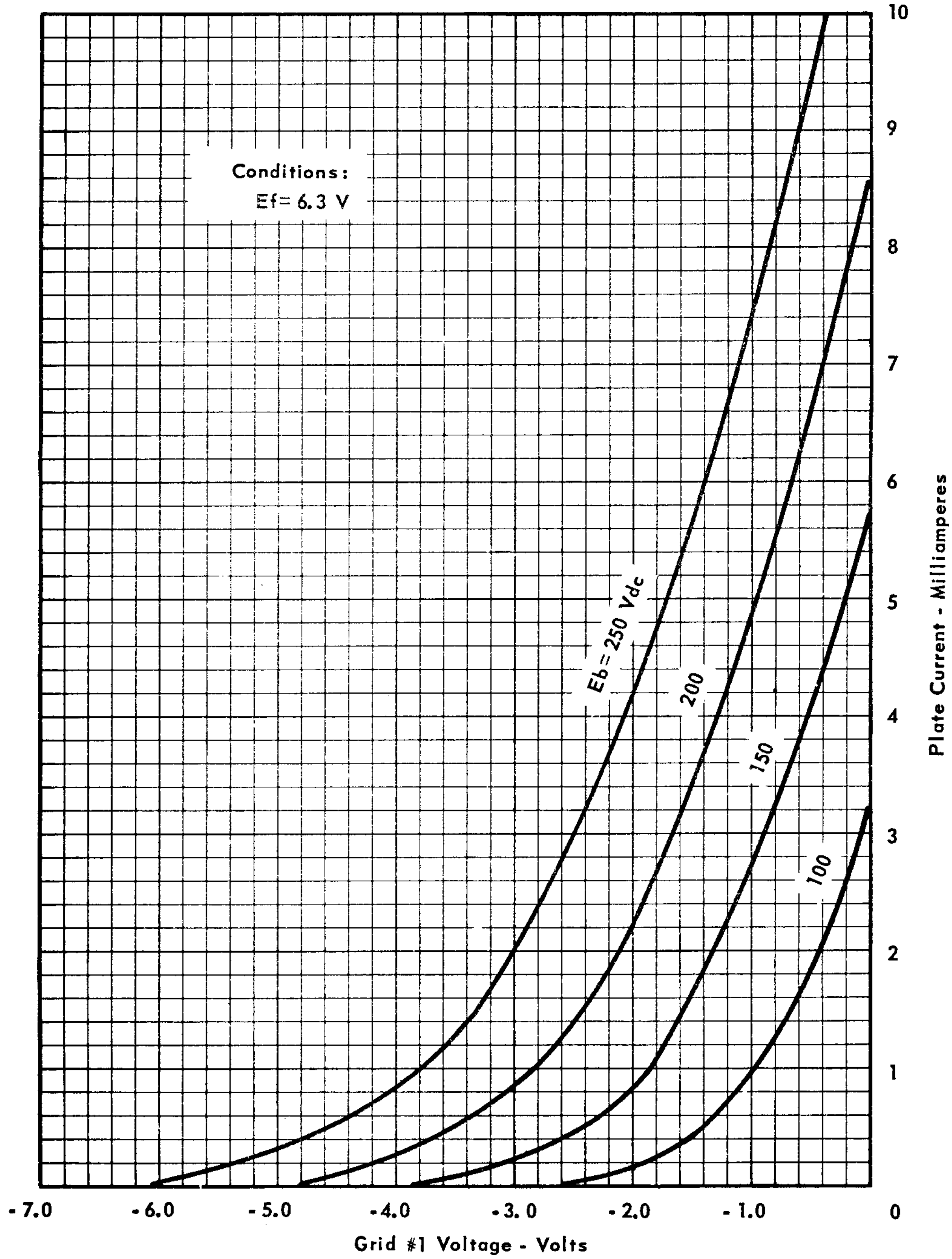


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AVERAGE CHARACTERISTICS



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